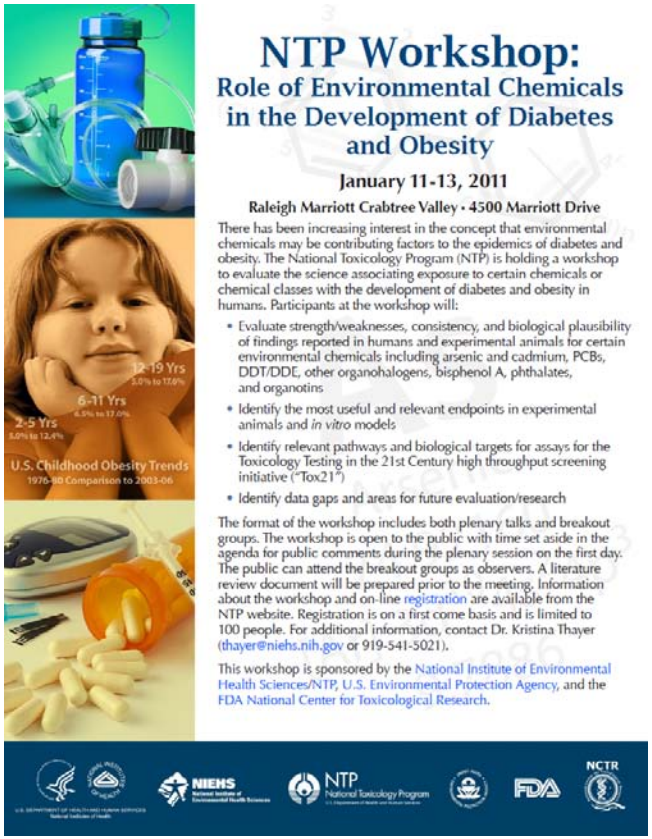
NTP
National Toxicology Program

NTP Workshop: Role of Environmental Chemicals in the Development of Diabetes and Obesity
January 11-13, 2011

Michael Gallo, Workshop Chair

Dept. of Environmental & Occupational Health, University of Medicine & Dentistry of New Jersey



DEPARTMENT OF HEALTH & HUMAN SERVICES • USA

Interest

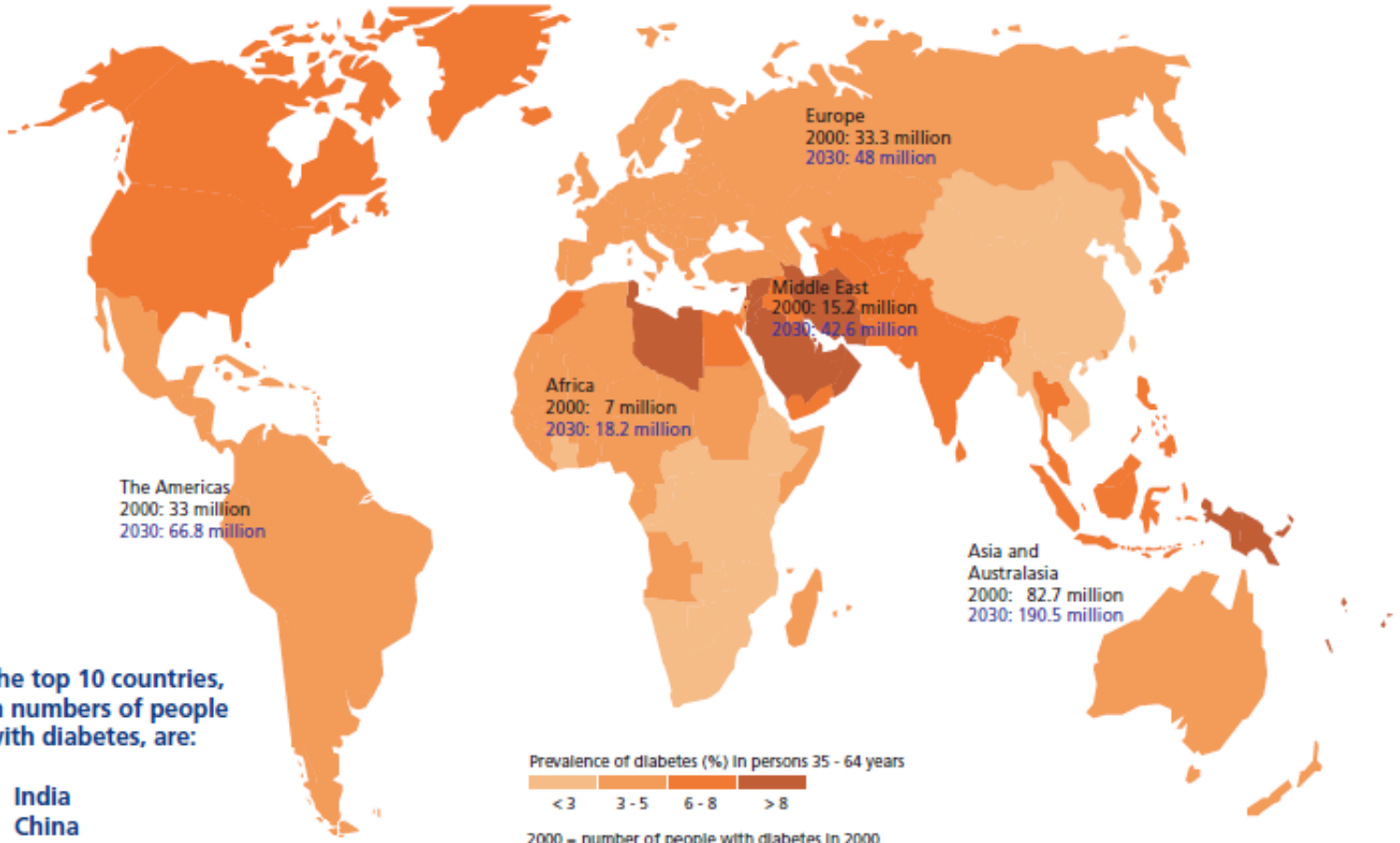
- President’s Childhood Obesity Taskforce
- NIH Obesity Taskforce
- President’s Children's Environmental Health Task Force
- International Obesity Taskforce

Diabetes & Obesity are Major Threats to Human Health

- **12.9% of people ≥20 of age in US estimated to have diabetes of which ~40% undiagnosed NHANES 2005-2006 (Cowie 2009)**
  - Based on fasting glucose and 2-hour glucose tolerance
  - ~40% with diabetes or pre-diabetes
  - 29.5% with pre-diabetes (impaired fasting glucose or impaired 2-hour glucose tolerance)
- ~70% of type 2 diabetes risk attributed to overweight/obesity (Eyre 2004)
  - i.e., ~30% not accounted for by body weight
- Increased age-adjusted prevalence of metabolic syndrome
  - 29.2% NHANES 1988-1994 to 34.2% NHANES1999-2006 (Mozumdar 2011)

Cowie CC (2009) Diabetes Care 32(2): 287-294; Eyre H (2004) CA Cancer J Clin 54(4): 190-207; Mozumdar A (2011) Diabetes Care 34(1): 216-219.

Prevalence of diabetes



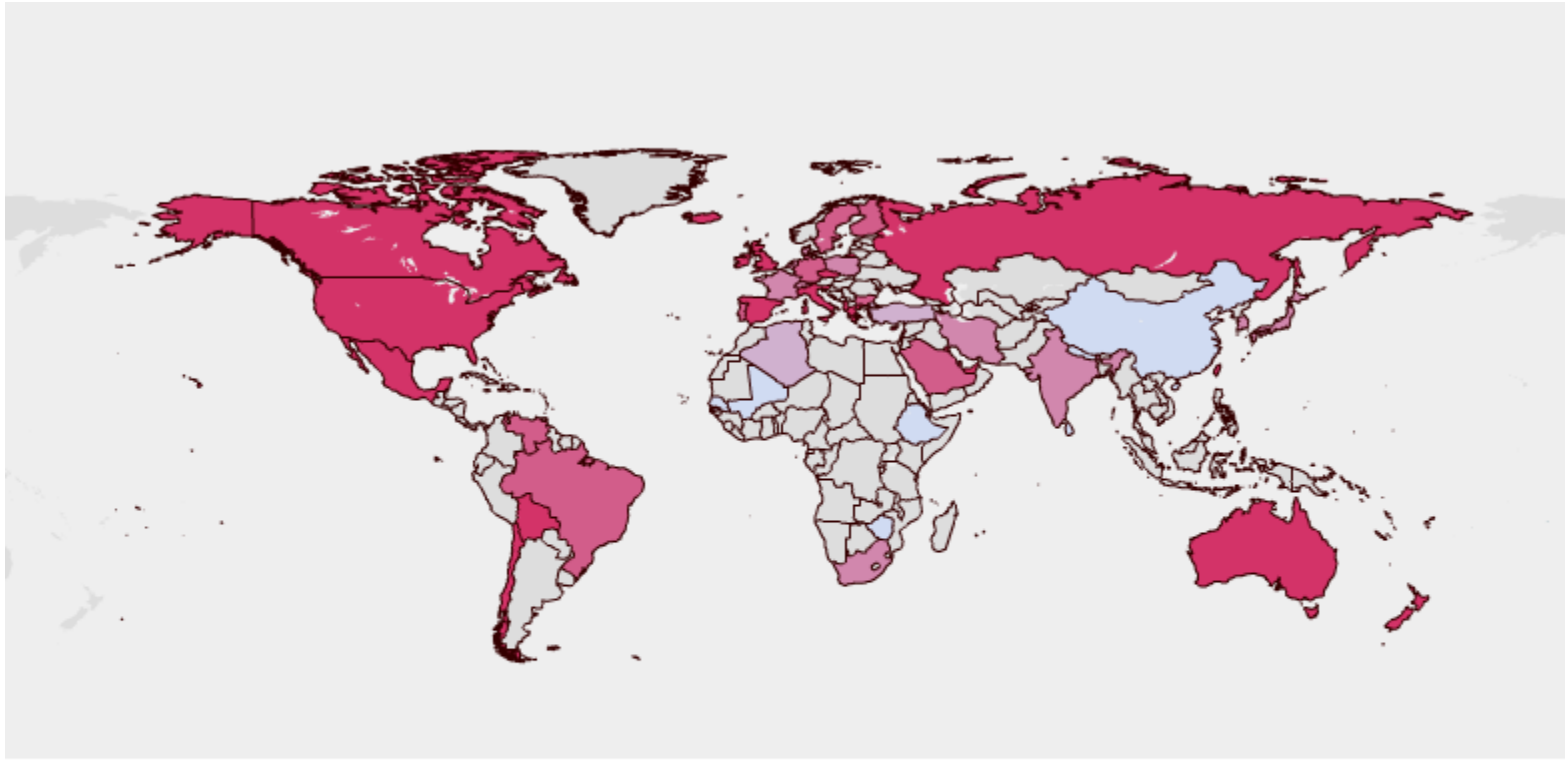
The top 10 countries, in numbers of people with diabetes, are:

India
China
USA
Indonesia
Japan
Pakistan
Russia
Brazil
Italy
Bangladesh

Year		2000	2030
Ranking	*Country*	*People with diabetes (millions)*	
1	India	31.7	79.4
2	China	20.8	42.3
3	United States of America	17.7	30.3

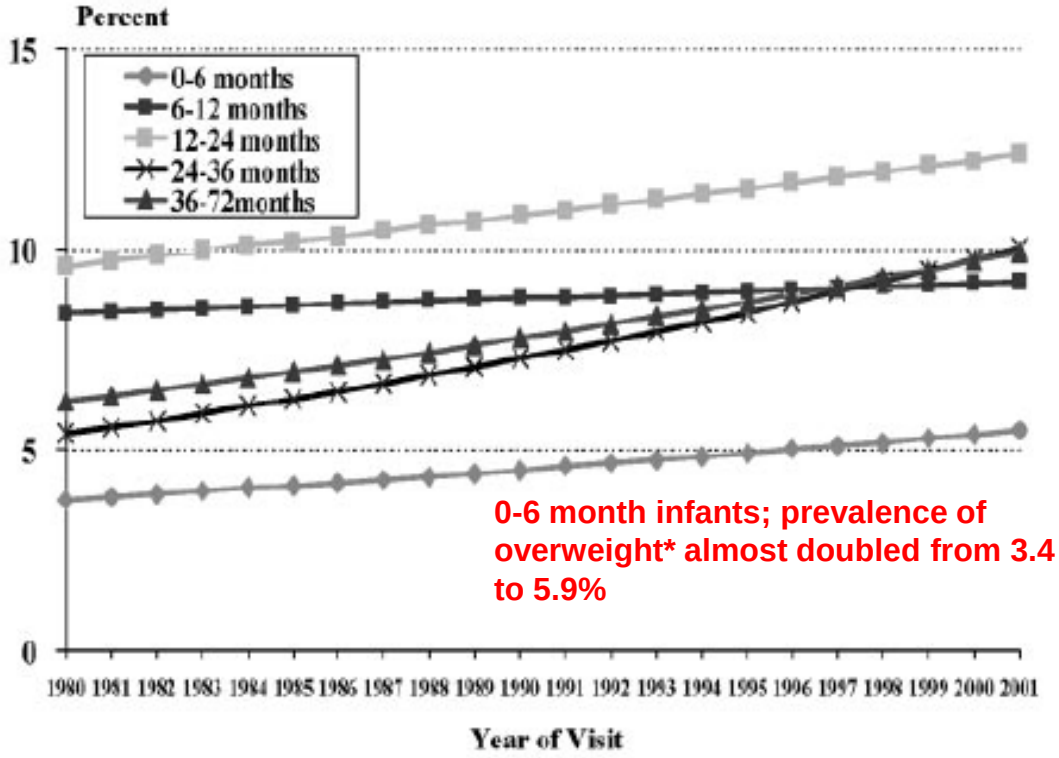
Source: WHO Diabetes Programme (http://www.who.int/diabetes/facts/en/)

Percent of Children with Obesity



Source: International Obesity Taskforce (http://www.iaso.org/iotf/obesity/)

Trends for overweight infants and children



Kim, J (2006). Obesity (Silver Spring) 14(7): 1107-1112. (data based on +366,000 well-child care visits at a HMO in Massachusetts)

- ~9.5% infants and toddlers with excess weight* in NHANES 2007-2008

Ogden CL (2010) JAMA 303(3): 242-249

* Weight-for-length/height ≥ 95th percentile

Non-Traditional Risk Factors for Obesity (Sept. 24, 2009 NIH Obesity Task Force Seminar Series)

- "Infectobesity - Obesity of Infectious Origin"
  Nikhil Dhurandhar, Ph.D. (Pennington Biomedical Research Center)

- "Chemicals in the Environment: What Doesn't Make Us Sick Makes Us…Fatter"
  Jerry Heindel, Ph.D. (NIEHS)

- "What's Eating You? Stress Pathways to Obesity"
  Elissa Epel, Ph.D. (UCSF)

- "The Human Gut Microbiota: Dining In with a Few Trillion Fascinating Friends"
  Jeffrey Gordon, M.D. (Wash U)

Reviews/Commentaries/Position Statements

CONSENSUS STATEMENT

Consensus Development Conference on Antipsychotic Drugs and Obesity and Diabetes

American Diabetes Association
American Psychiatric Association
American Association of Clinical Endocrinologists
North American Association for the Study of Obesity

Concluded that certain second generation antipsychotic drugs are associated with the potential for rapid weight gain, deterioration in lipoprotein profile and increased risk of type 2 diabetes

(2004) Diabetes Care 27(2): 596-601

Overall Goals of Workshop

- Develop research agenda
  - Evaluate strength/weaknesses, consistency, and biological plausibility of findings reported in humans and experimental animals
  - Arsenic/other metals, POPs, BPA, organotins, phthalates, pesticides and nicotine
- Identify the most useful and relevant endpoints in experimental animals, *in vitro* models and screening systems
- Identify data gaps and areas for future evaluation/research.

Research Strategies and Critical Data Needs (Breakouts A-D, Wednesday 3 to 5 pm)

- Propose a research strategy to explore the significance of exposures to environmental chemicals in the rising rates of obesity and diabetes, including human, animal and mechanistic studies
- Are there immediate data gaps that if filled would provide significant direction to longer term research programs?
- Are there research avenues that should be avoided?
- Are there new research tools that need to be developed?

Public Comments

- State name and affiliation
- Pre-registered = 7 minutes
- Not pre-registered = 3 minutes